6. *O. lacteo-strigata*, n. sp.

O. curta, tomento holosericeo rufo-brunneo vestita: elytris apicem versus attenuatis, pone medium fascia pallidiore strigis lacteis undulatis marginata, prope apicem linea transversa undulata lactea ornatis. Long. 6 lin. ♂.

Head brown: eyes rather distant from the central line on the vertex. Antennæ pitchy-brown, base of joints paler greyish. Thorax punctured on the disk as well as along the fore and hind margins: the anterior pair of tubercles prominent, conical, dusky; the posterior one slightly elevated; the lateral ones conical. Elytra rather thickly punctured from the base to three-fourths the length, punctures large, the basal ones accompanied by granulations, each near the base furnished with a longitudinal ridge-shaped tubercle, slightly hooked behind; the basal half is deep red-brown, deepening on the sides to violet-black; the space between the pale-brown median belt and the subapical transverse undulated line is lighter brown, streaked longitudinally with dark brown; the subapical milky belt emits short branches, and is edged posteriorly with dark brown; extreme apex light brown: the apex is obliquely truncated; the external angles of the truncature acute, but not produced. Legs and under-surface of the body clothed with silky-brown grey pile.

This species was rare on the Upper Amazons. In facies it resembles species of the genus *Alcidion* (group Acanthocinitæ); it is readily distinguished, however, by the short clavate basal joint of the antennæ.

[To be continued.]

V.—*Remarks on some novel Phases of Organic Life, and on the Boring Powers of minute Annelids, at great Depths in the Sea.* By G. C. Wallich, M.D., F.L.S. & F.G.S.

In the notice of the material obtained by the soundings taken on board H.M.S. 'Cyclops' in 1857, appended to the official report of Captain Dayman*, Professor Huxley mentions having met with a number of small rounded bodies, which he describes as consisting of several concentric layers surrounding a minute clear centre, and looking, at first sight, somewhat like single cells of the plant "Protococcus." To these bodies Professor Huxley provisionally applied the designation of *Coccoliths*.

In the deepest soundings taken during the recent expedition

* "Deep-Sea Soundings in the North Atlantic Ocean, between Ireland and Newfoundland, made in H.M.S. Cyclops, Lieutenant-Commander Joseph Dayman, in June and July 1857, published by order of the Admiralty."

to the North Atlantic, I detected these very curious bodies in great numbers,—occurring not only in the free state, noticed by Professor Huxley, but as adjuncts to minute spherical cells, upon the outer surface of which they were adherent in such a manner as to leave no doubt of that being their normal position. Whilst alluding to their occurrence, in my published "Notes on the Existence of Animal Life at vast depths in the Ocean," I ventured a surmise as to their being a larval condition of some of the Foraminifera,—first, in consequence of their being invariably present in greatest quantity in such of the deep-sea deposits as were most prolific of these organisms; secondly, because, in one or two instances, Coccoliths had been met with by me adherent to Foraminiferous shells in such a manner as to render it highly improbable that they could have attained their position by accident; and lastly, because the spherical cells, to which reference has been made, when entirely freed from their adherent Coccoliths, presented no discernible points of difference, save as regards somewhat inferior dimensions, from the minute and nearly hyaline solitary cells of the earliest stage of the Globigerinæ.

On reference to the annexed woodcut it will be seen that the composite bodies to which I allude, and to which I propose to give the name of *Coccospheres*, are minute spherical cells (figs. 1 & 2) having a defined limitary wall, and that upon their outer surface the Coccoliths of Professor Huxley are arranged at nearly regular intervals. The cells, when crushed, are seen to contain a homogeneous, gelatinous, and

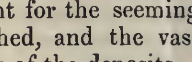

1 2

almost colourless matter, exhibiting no visible trace of organization, and, in all probability, consisting of sarcode. The wall of the cell may be distinctly seen under a high power; but from the minuteness of the entire structure, I have hitherto found it impossible to do more than attest its existence. Accordingly there is nothing visible to show whether the wall is formed of one or more than one layer. Cells are sometimes met with in a fractured condition; but I have never observed a collapsed specimen, or flattened-out fragment, such as would frequently occur were the basis of the wall formed of anything more yielding than calcareous matter. In like manner, I have hitherto failed to detect markings or apertures in the limitary wall of the Coccosphere. The solitary cells vary in diameter from $\frac{1}{1600}$th to $\frac{1}{1250}$th of an inch, when seen separately. Forming part of a series, as in the specimen of *Textularia* presently to be described, some cells, however, attain a much larger size.

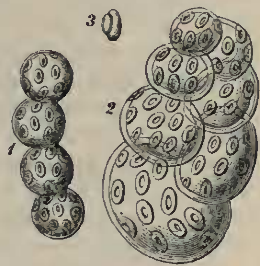
The Coccoliths, to which term I would restrict the minute bodies described by Professor Huxley, are of an oblong shape, concave on their internal aspect, namely that on which they are attached to the surface of the Coccosphere-cells, and convex externally; in short, they are spoon-shaped, only with a much less marked convexity and concavity. In some specimens, a single aperture, only, occurs at the central portion. In others the aperture appears to be double; or, rather, there are two perforations placed side by side, in the direction of the long axis of the body, and separated from each other by an extremely delicate transverse band; whilst the external marginal surface, which thus constitutes a quoit-like but oblong ring round the central perforated portion, is striated in a radiate manner. When the two perforations are present, the little mass closely resembles a miniature plate of *Synapta.* The Coccoliths, like the spheres upon which they rest, are transparent and devoid of colour. Their mode of attachment is undistinguishable, owing to their extreme minuteness. They appear, however, to be simply placed in contact with the surface of the Coccosphere-wall, and to be retained in position by the delicate gelatinous layer in which the entire organism is invested. We may thus account for the seeming facility with which the Coccoliths are detached, and the vast numbers of free Coccoliths which crowd many of the deposits.

It is necessary to state that a high magnifying power and very careful and brilliant illumination are requisite to enable us to see the structure of the Coccoliths to this extent. Their presence in the finer portion of the deposits may just be ascertained under a good $\frac{1}{2}$-inch lens; but in order to make out the apertures and striation, a $\frac{1}{6}$ or $\frac{1}{8}$, of first-rate construction, is indispensable,—the difficulty of obtaining clear definition being materially, and almost insurmountably, enhanced from the circumstance of its being necessary to mount the material in its normal state, inasmuch as subjection to acids at once annihilates all trace of the objects under notice.

The average length of each Coccolith is about $\frac{1}{2700}$th of an inch. Fig. 3, *a, b, c,* represents these bodies as seen from their external, lateral, and inferior aspects. Fig. 4 gives a still more enlarged view of one, as seen from its external or convex aspect.



In the adjoining woodcut, fig. 1 exhibits a specimen in which four Coccospheres, with their adherent Coccoliths, are united together in a linear series similar to that of the chambers of the *Nodosariæ.* The cells are all, however, of uniform size, and smaller than the majority of the separate single specimens. Fig. 2 represents an unmistakeable *Textularia* (probably *T. variabilis,* Will.), the chambers of which apparently consist of several Coccospheres, in this instance of different sizes, arranged according to the double alternating order typical of the genus referred to. The chambers, as will be seen, are seven in number, the smallest and oldest measuring $\frac{1}{1250}$th of an inch, whilst the largest and last-developed measures $\frac{1}{450}$th of an inch. The entire specimen presents the transparency and delicacy of the normal Coccospheres. No septal apertures are visible; but this may arise in a great measure from the position of the specimen, which is preserved on a slide in balsam, and also from the imperfect manner in which it was necessary to clean the deposit before mounting it.



On the exposed surface of each chamber the Coccoliths are distinctly visible. That their adherence in this fashion is not the result of accident is, I think, evident both from their disposition and the circumstance of numerous Foraminifera, present throughout the whole of the same slide, and of equal delicacy and transparency, not exhibiting a single Coccolith on their surfaces, although great numbers occur around them on every side.

During my earlier examinations of these remarkable objects, I repeatedly detected Coccoliths adherent to Globigerina-shells; but in no other instance than that just cited have I found the whole, or indeed more than one chamber of any Foraminiferous shell, so studded, and in other respects presenting appearances so identical with those seen in the free Coccospheres of which I have spoken.

It is certainly strange that, during the examination of a large series of slides exhibiting the lighter particles of the material in which the Coccospheres and Coccoliths abound, only one good example of a Foraminiferous shell should have been observed in the condition alluded to,—the four Coccospheres spoken of as occurring united in a linear series, although closely resembling the Nodosarian type in point of arrangement, presenting no positive evidence of their Foraminiferous origin. But it must be borne in mind, in investigating the lower organic forms of the animal and vegetable kingdoms, that instances are far from rare in which early phases of development are so ephemeral as to render the chances of their taking place under the eye of the observer extremely scanty. And again, for reasons already assigned, it is far from improbable that, although actually present in the material under analysis, the appearances are constantly overlooked.

These minute bodies, however, possess a high degree of interest apart from that arising from their association with the deep-sea deposits actually taking place in our own day, and this renders it particularly desirable that the attention of observers should be directed towards them. I allude to the discovery in the Chalk, by Mr. H. C. Sorby of Sheffield, of objects either identical with them or so nearly identical as to leave no doubt of their close affinity, and to the important additional evidence herein furnished regarding the identity in origin of some of the recent and more ancient oceanic deposits. It is not my wish at present to do more than point out these facts. Whether it be eventually shown that the association between these bodies and the Foraminifera is purely fortuitous or otherwise, there cannot be a doubt that they have some important office to perform in the history of the deep-sea deposits, and that the investigation of this office will materially assist us in clearing up the mystery that surrounds the occurrence of similar objects in the Chalk.

I have also to direct attention to some curious facts which have presented themselves to my notice whilst investigating the structure of certain Foraminiferous shells, and which illustrate, in a remarkable manner, the soundness of the views first propounded by Professor Carpenter with reference to the transmutation of many of the reputed species of these organisms.

Having selected some well-developed *Biloculina*-shells, I bisected them in various planes, and found that the innermost chamber of each individual—for segment it cannot in this case properly be termed—was in reality a minute and perfect *Miliola*, —this innermost chamber being, of course, the primordial chamber of the group. As is well known, *Biloculina* is a symmetrically-developed Foraminifer, the segments of which are arranged in alternating series, but with their margins in the same plane. In *Miliola*, on the other hand, the arrangement of the segments is asymmetrical, the plane of growth being a revolving one. Wide as the interval between the typical *Miliolidæ* and *Biloculinæ*, at first sight appears, the examples to which I refer show that there is no true line of demarcation between them, and that the one is neither more nor less than the primordial chamber of the other; whilst the future development of the primordial portion, into what has heretofore been considered a typical adult *Miliola* or a perfect *Biloculina*, depends wholly therefore on the conditions under which its further growth is regulated.

In the specimens under notice, the minute *Miliolæ* were found situated between the two earliest segments formed on the *Biloculina* type; and within the boundary so constituted it was placed, apparently, in an unattached state, but so closely pressed on as to indicate that the growth of the new segments took place upon the external surface of the primordial *Miliola*-chamber, and, as it were, on a mould. The minute *Miliola*, disposed with its long axis towards the axis of the septal orifices of the *Biloculina*-segments, is of sufficient size to be visible by the naked eye, and presents but one perfect revolution, as shown in fig. 3 of the last woodcut, there being no trace of a fractured margin of attachment at any portion of its surface.

Before concluding, I would also mention having met with several examples of Foraminiferous shells, brought up from the greatest depths, perforated, in all probability, by the minute boring Annelids that construct and inhabit the tubes of which I have made mention in my "Notes." The extreme delicacy of the inhabitants of these tubes has, as yet, completely baffled me in all my attempts to extract them and determine their character. In addition, however, to the tubes, formed in so singular a manner, of innumerable carefully selected Globigerina-shells cemented together, there also occur other tubes, in which the internal layer is a cylinder of tough membranous material with a rich sienna tint, whilst its outer surface is strengthened and protected partly by numerous Globigerina-shells, as in the previous case, and partly by a layer of silicious spicules, probably derived from some minute sponge. The perforations in the shells are invariably of one character, and consist of an aperture bored through and through, but having the entire thickness of the shell-wall, from the inner surface to the outer one, as it were countersunk. Accordingly, in section, such a perforation presents a truncated cone, the apex of which is directed inwards.

It has repeatedly been observed that, in the manufacture of telegraphic cables, it is a matter of vital importance to guard against the attacks of Annelids capable of thus penetrating hard substances at the greatest depths. Owing to the difficulty of boring into gutta percha, unless under the action of chemical solvents, I cannot conceive much danger is to be apprehended from its employment as the coating medium. If Annelids are able to drive their boring apparatus through gutta percha, it can only be when it has assumed the brittle, macaroni-like structure peculiar to it after long-continued exposure to heat, or in the case of impure and adulterated gutta percha. Pure caoutchouc, I do not hesitate to say, is impervious to a boring apparatus like that of the *Teredines*,—unless, as before mentioned, under the action of a chemical solvent, when, of course, no boring tool is necessary to render the mischief complete and fatal. And, lastly, there is this consolation for the advocates of gutta percha and caoutchouc coverings for submarine cables:—If their little hidden enemies at the bottom of the sea are so far advanced in civilization as to be able to discriminate when they ought to use their augers, or fall back upon their chemical laboratories for aid, neither glass, nor iron, nor hemp, nor adamant itself, will suffice to defy them. If any material exists, the characters of which are so thoroughly dissimilar from those of any substance known to occur at the bottom of the sea as to render it in the highest degree improbable that such creatures as live there could improvise means to pierce it, whilst, at the same time, it would secure perfect insulation of the telegraphic wire, *caoutchouc is that material.*

VI.—*Improved Method of making Microscopic Sections.* By G. C. Wallich, M.D., F.L.S.

To the Editors of the Annals and Magazine of Natural History.

Gentlemen,

Having devised a method of producing the finest sections of minute microscopic objects, such as Foraminifera, Diatomaceæ, and the like, which will, I think, prove of great service, I beg leave to lay it before your readers.

Hitherto, in making sections of any minute organized particles, the practice has been to mix the material with Canada balsam hardened over the spirit-lamp in the usual manner, and to grind down the balsam and its contents on a glass slide, until of the requisite degree of thinness,—a thin glass cover being placed on the ground surface, in order to complete the operation.

This plan, however, possesses the great disadvantage of affording only one ground side for microscopic examination, namely the one next to the observer's eye; whilst, the surface next the glass slide being in its natural state, not only is perfect definition prevented, but it is impossible to ensure anything like a uniform thickness of the various minute sections present.

To obviate this defect, I simply substitute, for the glass slide employed in the early stage of the process, a thin film of mica, mixing the material to be operated on with the balsam, and hardening it by heat in the usual mode. The slip of mica so prepared is now transferred to a glass slide, and secured by balsam as before, the mica being next to the glass. The operation of grinding down the exposed surface having been carried to the desired limit, and the surface carefully washed with water in order to carry off all loose particles, heat is applied to the under surface of the slide in order to drive off the last remnant of moisture left from the process of grinding-down. The slide is then heated just sufficiently to admit of the detachment of the mica-film and its burden *in situ*. A clean slide is now gently heated, and the mica-film, with its balsam-surface